



FAA-E-2468
November 18, 1970

DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION SPECIFICATION

TEST KIT, V-RING LOCALIZER

1. SCOPE

1.1 Scope.- The equipment covered by this specification consists of an antenna sampling loop, various transmission line devices, networks and adapters and includes two portable carrying cases for storage and transport of these items. The test kit is intended for use in the installation and alignment of the ILS V-Ring localizer antenna array.

2. APPLICABLE DOCUMENTS

2.1 FAA specifications.- The following FAA specification, of the issue specified in the invitation for bid or request for proposals, form a part of this specification:

FAA-G-2100/1	Electronic Equipment, General Requirements; Part 1, Basic Requirements for all Equipments
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(Copies of this specification, and other applicable FAA standards and drawings, may be obtained from Federal Aviation Administration, Washington, D.C. 20590, ATTN: Contracting Officer. Requests should fully identify material desired, i.e., specification numbers, dates, amendment numbers, complete drawing numbers; also the requests should identify the invitation for bids, request for proposals, or the contract involved or other use to be made of the requested material.)

2.2 Military specification.- The following Military specification of the issue in effect on the date of the invitation for bids or request for proposals, forms a part of this specification and is applicable to the extent specified herein.

MIL-E-17555 Electronic and Electrical Equipment, and
Associated Repair Parts, Preparation for
Delivery of

(Information on obtaining copies of Military specifications is given in FAA-G-2100, Supplement, FAA List of Applicable Documents.)

3. REQUIREMENTS

3.1 Equipment to be furnished by the contractor.- Each equipment furnished by the contractor shall be complete in accordance with all specification requirements and shall include the items and quantities tabulated below. Instruction booklets in accordance with 3.20 shall be furnished with each equipment in the quantities specified in the contract schedule.

<u>ITEM</u>	<u>COMPONENT</u>	<u>QUANTITY</u>	<u>PARAGRAPH</u>
1	Antenna sampling loop	1 ea.	3.6
2	Power divider	1 ea.	3.7
3	Adjustable attenuator	1 ea.	3.8
4	Phase shifter	5 ea.	3.9
5	Rigid air line	2 ea.	3.10
6	Cable assembly (W1)	1 ea.	3.11
7	Cable assembly (W2)	2 ea.	3.12
8	Cable assembly (W3)	5 ea.	3.13
9	Cable assembly (W4)	5 ea.	3.14
10	Cable assembly (W5)	10 ea.	3.15
11	874-QNJL adapter	1 ea.	3.16
12	874-QBJL adapter	1 ea.	3.16
13	874-QNPL adapter	2 ea.	3.16
14	Type UG-201/U adapter	1 ea.	3.16
15	874-R22-LA patch cord	2 ea.	3.16
16	Rotary attenuator	1 ea.	3.17
17	Fixed attenuator (1dB)	1 ea.	3.17
18	Fixed attenuator (2dB)	1 ea.	3.17
19	Carrying cases	2 ea.	3.18

3.2 Definitions.

3.2.1 Ambient conditions.- The ambient conditions shall be those of Environment II (1-3.2.23 FAA-G-2100/1).

3.2.2 Characteristics of V-Ring antenna element.- Each antenna consists of a ring driven element, fed across a one inch gap at the front of the ring and a vee parasitic reflector element spaced to the rear. Each element is fabricated from 1-5/8 inches outside diameter aluminum alloy tubing and is attached to an aluminum alloy masthead. The ring is formed by bending two sections of tubing through 180 degrees on an outside radius of 12-11/16 inches. The two halves of the ring are attached to the masthead and the finished ring is in the horizontal plane. The overall lateral dimension of the ring is 36-5/8 inches. There is a teflon spacer across the one inch gap at the front of the ring and the front edge of the gap is 27-13/16 inches from the centerline of the mast. The vee reflector is attached to the rear of the masthead by means of a length of tubing. The apex of the vee is 35-1/2 inches from the mast centerline and 63-5/16 inches from the front edge of the gap in the ring. The arms of the vee are 29-39/64 inches long and mounted in the same plane as the ring driven element with each arm of the vee subtending a 45 degree angle each side of extension arm. The antenna element includes a protective cover, 7-1/2 inches long, mounted over the one inch gap. For informational purposes, the V-ring antenna element and its supporting structure are illustrated in Figure 1.

3.3 General functional requirements.- The various items specified herein will provide the basic components required:

- (1) to measure the phase relationship between the antenna currents of the elements of the V-Ring antenna array,
- (2) to sample the RF energy from each V-Ring antenna element for purpose of determining relative amplitude of the antenna currents,
- (3) to reduce the mutual coupling effects between antenna elements so as to improve the antenna current distribution across the operating array.

3.4 Frequency range.- The equipment shall operate over the frequency range of 108.0 to 112.0 MHz. All specification requirements shall be met over this range.

3.5 Characteristic impedance.- The characteristic impedance of the equipment specified herein shall be 50 ohms.

3.6 Antenna sampling loop.- The antenna sampling loop shall be constructed for hooking over the element of a V-ring antenna (not required to be furnished under this specification) in order to sample a portion of the RF energy radiated by the antenna. The sampling loop shall consist of an electrostatically shielded coupling loop and a fixed (non-adjustable) RF network serving as the load for the coupling loop and providing a nominal $50 + j0$ unbalanced RF output impedance. A shielded case shall be provided for housing the RF network and for mounting the coupling loop. A type BNC output receptacle shall be mounted on the bottom of the case. The RF network components within the case shall be readily accessible by the removal of appropriate access covers. A hang-on device shall be provided for freely suspending the antenna sampling loop from the V-ring antenna element in the vertical plane directly below the feed gap. The hang-on device shall be constructed of non-conductive material in accordance with paragraph 1-3.15.3 of FAA-G-2100/1 and shall be designed so that the sampling loop can be easily hung and removed from the V-ring antenna element with the feed gap protective cover in place. Figure 2 portrays a typical design of an antenna sampling loop complete with hang-on device.

3.6.1 VSWR.- The input VSWR of the sampling loop shall not exceed 1.3 when fed from a 50 ohm line.

3.6.2 Coupling factor.- Under normal test conditions, the coupling factor of the sampling loop, mounted on a V-ring antenna element across the RF feed point, shall be 45 ± 3 dB. For test purposes, the coupling factor shall be the dB ratio of the RF signal source at the input connector of the antenna element to the RF signal measured at the output connector of the antenna sampling loop with the output connector terminated in a 50 ohm load.

3.6.3 Coupling factor stability.- The variation of coupling factor over the service conditions shall not exceed 0.5 dB when referenced to the coupling factor initially measured under normal test conditions.

3.6.4 Electrical symmetry.- Physical reversal of the vertical plane of the loop in a stationary V-ring antenna RF field shall result in a phase reversal in the output signal of $180^\circ \pm 2^\circ$. For test purposes, a reference phase measurement shall be established with the sampling loop hung on a V-ring antenna element. The position of the loop on the element shall then be reversed and, with all other conditions maintained the same, the phase of the output signal shall again be measured and shall fall within the above limits.

3.6.5 Protection.- With the sampling loop, mounted on the antenna element across the RF feed gap, no damage to the loop shall result with the application of 100W of RF power to the V-ring antenna element.

3.20 Instruction booklets.- The instruction booklet shall include a general description; electrical characteristics; complete calibration data; manufacturer's part numbers; maintenance instructions; and any descriptive data which, in the opinion of the contractor, would enhance the use of the equipment. The overall dimensions of the booklet shall not exceed 9 x 11-1/2 inches. The contractor's commercial instruction booklet will be acceptable if it meets the foregoing minimum requirements.

4. QUALITY ASSURANCE PROVISIONS

4.1 General.- See Section 1-4 of Specification FAA-G-2100/1 for quality control program requirements, classification of tests and general methods of sampling and inspection.

4.2 Design qualification tests.- The design qualification test listed in the following tabulation shall be conducted under normal test conditions.

<u>Paragraph</u>	<u>Test</u>
3.6.5	Protection (110 MHz)
3.6.6	Loading (110 MHz)

4.3 Type tests under the service conditions.- The test listed in the following tabulation shall be conducted under test procedures described in 1-4.12 of FAA-G-2100/1, except that the equipment may be removed from the environmental chamber for the measurements in Steps 1, 3, 4 and 6 provided that measurements are made as rapidly as possible after removal. The final measurement is the only one required in Step 4. Also, in Step 8, change "48 hours" to "two (2) hours".

<u>Paragraph</u>	<u>Test</u>
3.6.3	Coupling factor stability (110 MHz)

4.4 Production tests.- The tests listed in the following tabulation shall be conducted under normal test conditions. The tests shall be conducted at 108, 110, and 112 MHz except where otherwise specified.

<u>Paragraph</u>	<u>Test</u>
3.6.1	VSWR
3.6.2	Coupling factor
3.6.4	Electrical symmetry
3.7	Power divider VSWR
3.8	Adjustable attenuator VSWR
3.9	Phaser shifter, Range of adjustment (110 MHz), Insertion loss, VSWR
3.10	Air line VSWR
3.11	Cable assembly (W1) VSWR

<u>Paragraph</u>	<u>Test</u>
3.12	Cable assembly (W2) VSWR
3.13	Cable assembly (W3) Combined electrical length (110 MHz), VSWR
3.14	Cable assembly (W4), electrical length (110 MHz), VSWR
3.15	Cable assembly (W5), electrical length (110 MHz), VSWR
3.17	Attenuator VSWR

5. PREPARATION FOR DELIVERY

5.1 General.- Unless otherwise specified in the contract, the equipment shall be prepared for domestic shipment in accordance with the following subparagraphs.

5.2 Packaging.- Packaging shall be in accordance with Specification MIL-E-17555, Level A, Method II.

5.3 Packing.- Packing shall be in accordance with Specification MIL-E-17555, Level B. No more than one set of equipment and associated items shall be packed in each shipping container.

5.4 Marking.- Each package and shipping container shall be durably and legibly marked with the following information:

Name of Item and FA Type Designation
Serial Number(s)
Quantity
Contract Number
Federal Stock Number
Gross Weight of Container
Manufacturer's Name

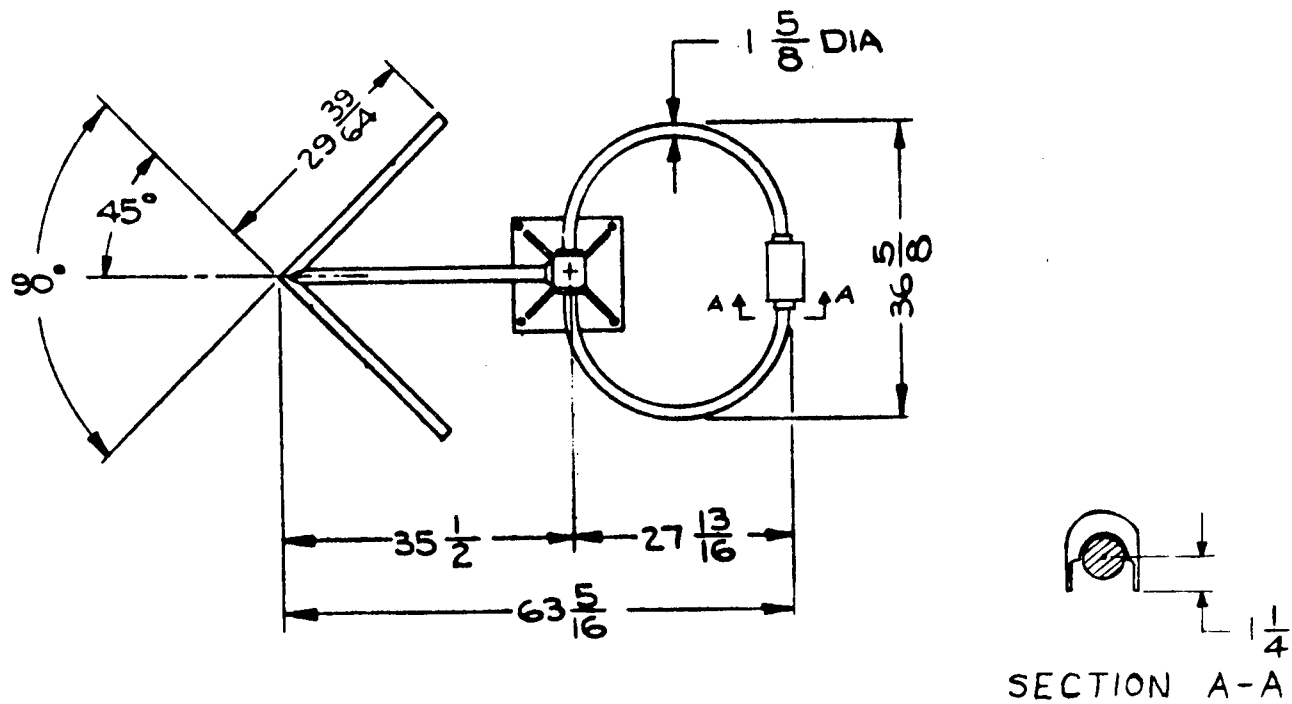
6. NOTES

6.1 Notes on information items.- The contents of the subparagraph below is only for the information of the Government program office. It is not a contract requirement except to the extent that it may be specified elsewhere in the contract as such.

6.1.1 Government furnished property.- The contract schedule should provide for the loan of a V-ring antenna element and its supporting structure to the contractor for the duration of the contract. This equipment will be needed for the duration of the contract for design and test purposes.

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FOR FIGURES 1 and 2, SEE PAGES 10 and 11.



DIMENSIONS IN INCHES

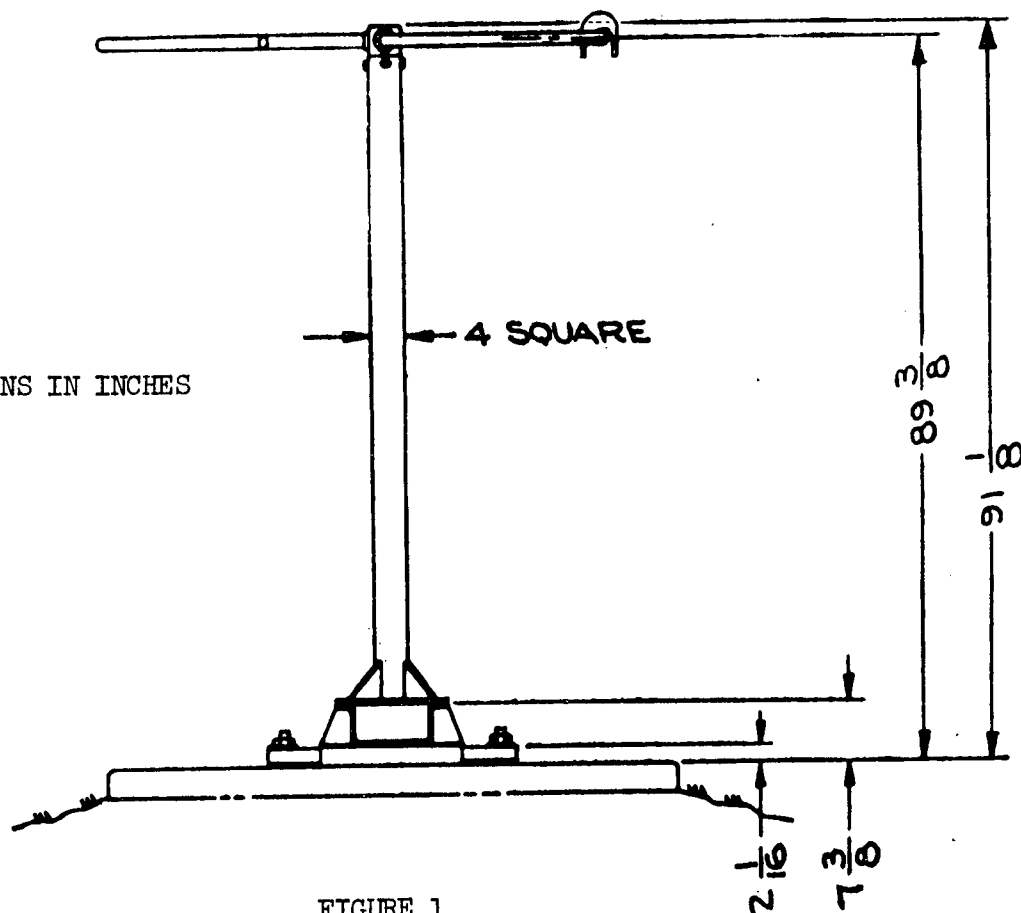


FIGURE 1

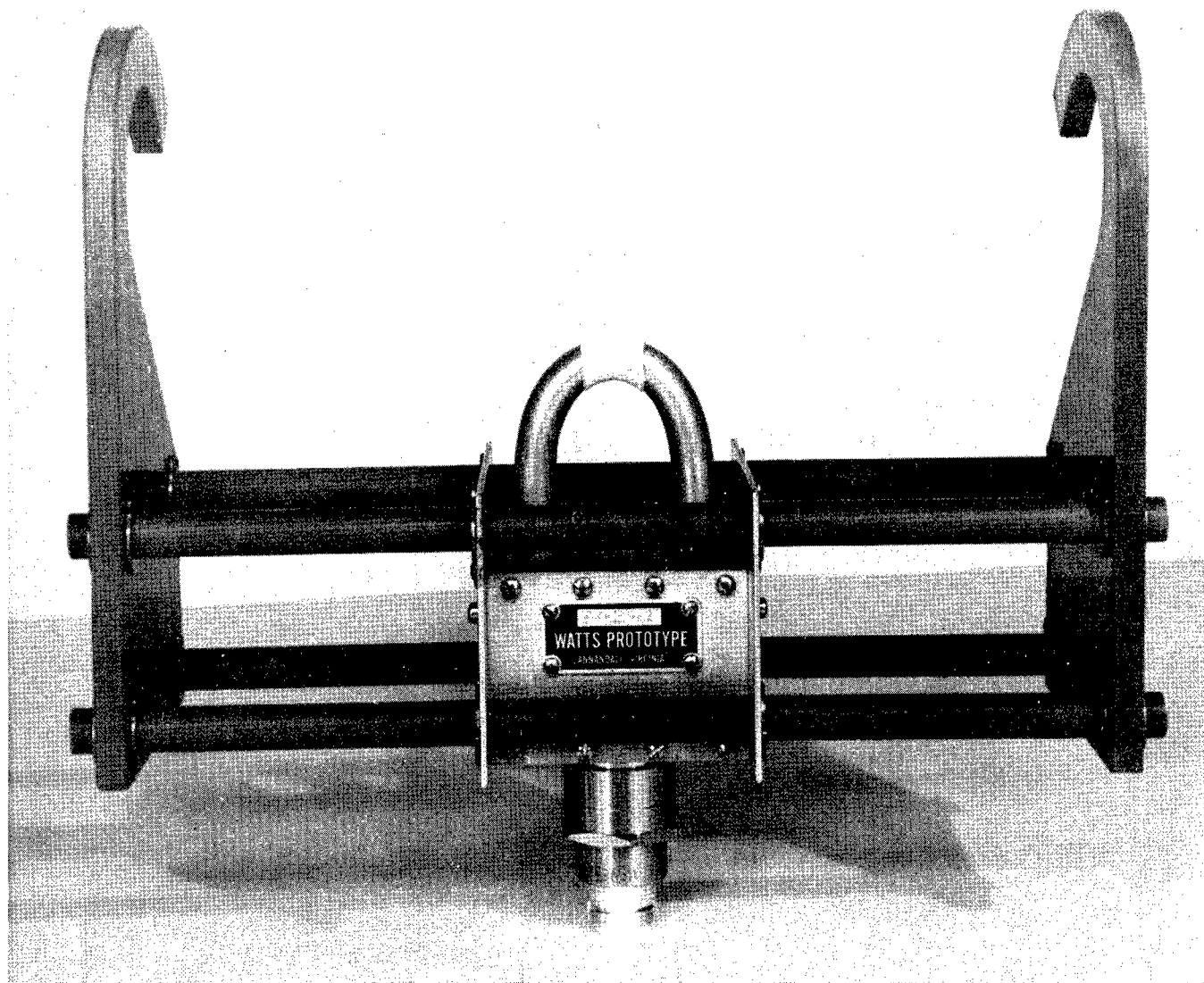


FIGURE 2 - ANTENNA SAMPLING LOOP

